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LISTS OF PUBLICATIONS AND PATENTS
OF THE
SOUTHERN UTILIZATION RESEARCH BRANCH
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UNITED STATES DEPARTMENT OF AGRICULTURE

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LIST OF PUBLICATIONS AND PATENTS OF THE

SOUTHERN UTILIZATION RESEARCH BRANCH

July - December 1954

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No.

COTTON

Fiber and fundamental investigations

1, 2 Daul, G. C., Reinhardt, R. M. and Reid, J. D.
THE REACTION OF COTTON WITH β-PROPIOLACTONE IN THE PRESENCE OF ORGANIC SOLVENTS. PART I: PURIFIED COTTON. Textile Res. Jour. 24(8): 738-743; PART II: Textile Res. Jour. 24(8): 744-747. 1954.

This work is part of a study whose objective is to determine whether the application of β-propiolactone to cotton would give it new and useful properties.

Part I shows that the reaction of purified cotton with β-propiolactone is affected by time, temperature, and concentration of reagents. In organic solvents, etherification occurs, apparently followed by polyesterification of the attached groups by additional lactone. The reaction could not be directed towards either etherification or esterification by means of acid and base catalysis. The extent of reaction was increased by "activation" with acetic acid before treatment. Part II shows that noncellulocis alkaline salts present in raw cotton catalyze the reaction and make possible weight gains of over 200%. Mercerization, increase in twist, and the presence of waxes and excess moisture adversely affect the concentration of reagents, as with purified cotton. Prepolymerized β-propiolactone will not react to any appreciable extent with raw cotton.

3 Honold, E., and Skau, E. L.
APPLICATION OF MERCURY-INTRUSION METHOD FOR DETERMINATION OF PORE-SIZE DISTRIBUTION TO MEMBRANE FILTERS. Sci. 120(3124): 805-806. 1954.

Results indicate that the effective pore-sizes previously calculated from the mercury-intrusion measurements of the cotton textile are reasonably accurate. The pore-size distribution data obtained by this method should prove useful in theoretical and practical investigations dealing with the characteristics of these and similar type filters -- and, in fact, of a variety of porous materials.

4 Loeb, L., and Segal, L.
PREPARATION OF COTTON CELLULOSE IV FROM COTTON CELLULOSE III. Jour. Polymer Sci. 14(73): 121-123. 1954.

Cellulose III was prepared from kiered cotton cellulose (cellulose I) by treatment with ethylamine; the resulting complex breaks down on evaporation of the amine. For conversion to cellulose IV, cellulose III was given a high-temperature glycerin treatment.

X-Ray fiber patterns of the starting material, cellulose III, and of the material after conversion to cellulose IV, were obtained. The morphological structure of cellulose IV was considerably degraded by the glycerin

No.

treatment; the product possessed little tensile strength. Almost no change in the lattice structure was indicated after acid hydrolysis.

5 Loeb, L., and Segal, L.
THE CHEMICAL REACTIVITY OF ETHYLAMINE-TREATED COTTON AS INDICATED BY ACETYLATION. Textile Res. Jour. 24(7): 654. 1954.

The full reactivity of the amine-treated and the mercerized cotton could be maintained only if drying was avoided after treatment. When maintained wet with nonaqueous solvent the reactivity of the amine-treated cotton was of the same order as that of mercerized cotton which had been maintained water-wet after mercerization. The rate of acetylation and degree of substitution obtained with an amine-treated cotton increased strongly as a function of presoak time in glacial acetic acid.

6 Reeves, R. E.
CUPRAMMONIUM-GLYCOSIDE COMPLEXES. VII. GLUCOPYRANCSIDE RING CONFORMATIONS IN AMYLOSE. Amer. Chem. Soc. Jour. 76(18): 4595-4598. 1954.

The gels which form when amylose is placed directly in cuprammonium, or when a neutral amylose solution is precipitated, contain about 0.5 to 0.6 mole of copper per mole of glucose anhydride. This low copper-to-glucose combining ratio, the limited solubility in cuprammonium, and the measurements of specific rotations for amylose and, for comparison, for methyl-β-maltoside, methyl-*a*-glucoside, and methyl-β-cellobioside in aqueous sodium hydroxide solutions, along with other considerations, point to the conclusions that amylose contains more than one ring conformation, evidence pointing toward two boat-form rings; but that alkali-amylose contains only one ring form -- tentatively held to be a boat-form.

7 Reeves, R. E., and Blouin, F. A.
EVIDENCE OF POLYMERIZATION IN TITANIUM (IV) SULFATE SOLUTIONS. Amer. Chem. Soc. Jour. 76(20): 5233-5235. 1954.

During studies of the reaction of titanium (IV) salts with cellulose and with simpler organic molecules in developing cotton flameproofing processes, differences were observed in the behaviour of titanium tetrachloride and titanium (IV) sulfate solutions. Studies of the titanium tartrate complexes to understand better the differences between the behavior of titanium chloride and titanium sulfate solutions have cast new light upon the behavior of aqueous solutions of titanium sulfate.

8 Reeves, R. E., and Jonassen 1/, J. B.
SPECTROPHOTOMETRIC EVIDENCE OF POLYMERIZATION IN PEROXITITANIC ACID SOLUTIONS. Amer. Chem. Soc. Jour. 76(21): 5354-5356. 1954.

1/ Tulane University, New Orleans, Louisiana.

No.

Absorption characteristics of peroxytitanic acid solutions in various concentration have been investigated as part of a study of the flameproofing potentialities of titanium compounds. A possible explanation of the fact that the light absorption of peroxytitanic acid solutions obeys Beer's law only at rather great dilutions is the polymerization of peroxytitanic acid. A series of closely related polymers forms in moderately concentrated solutions of the acid.

9 Segal, L.
ON THE PREPARATION OF CELLULOSE III WITH ETHYLAMINE. Textile Res. Jour. 24(9): 861-862. 1954.

The assumption by other investigators that evaporation of ethylamine from amine-saturated cotton cellulose (a treatment developed here to reduce the crystallinity) does not change the lattice type but only reduces the crystallinity is refuted. Some ideas are advanced for explaining the results obtained by the other workers.

10 Segal, L., and Nelson, M. L.
THE EFFECT OF AQUEOUS HYDROCHLORIC ACID ON THE COTTON CELLULOSE III LATTICE AND ITS IMPLICATIONS CONCERNING THE DETERMINATIONS OF CRYSTALLINITY AND LEVELING-OFF DEGREE OF POLYMERIZATION. Amer. Chem. Soc. Jour. 76(18): 4626-4630. 1954.

Cotton cellulose III, prepared by treating cotton in anhydrous ethylamine and decomposing the resulting amine-cellulose complex by removing the amine by evaporation, was treated with hydrochloric acid of various concentrations at high and low temperatures. X-Ray diffraction patterns of the resulting hydrocelluloses showed that reversion of cotton cellulose III to cellulose I, which takes place readily in boiling water, is almost completely prevented upon heating in acid when the concentration of 6 N, and takes place only to a slight and essentially equal extent in hot 4 and 2 N acid; but that very dilute acid (0.1 N) does not prevent reversion. The mechanism whereby strong hydrochloric acid prevents reversion of cotton cellulose III to cellulose I is unknown at present.

11 Segal, L., and Conrad, C. M.
X-RAYS AID COTTON RESEARCH. Textile Indus. 118(12): 116-120. 1954.

The application of x-ray diffraction techniques to cotton cellulose is discussed from the standpoint of cellulose fine structure, types of cellulose crystal lattices, amount of crystalline cellulose, orientation of crystalline cellulose, and crystal size. Examples are given where x-ray techniques have been of great help in plant breeding and in laboratory research on cotton fiber. Seven figures are included to illustrate text.

No.

12 Tripp, V. W., Moore, A. T., and Rollins, M. L.
A MICROSCOPICAL STUDY OF THE EFFECTS OF SOME TYPICAL CHEMICAL ENVIRONMENTS ON THE PRIMARY WALL OF COTTON FIBER. Textile Res. Jour. 24(11): 956-970. 1954.

The topography and structure of the primary wall of the cotton lint fiber are described and illustrated by electron micrographs. Changes brought about by alkali boil (kiering), hypochlorite and peroxide bleaching, mercerization, acid hydrolysis, and dry heat are shown. Noncellulosic constituents are progressively removed during alkaline kiering. Excessive conditions of kiering appear to damage the cellulose framework of the wall. Peroxide bleaching apparently removes noncellulosic material, but hypochlorite alone does not. Mercerization of the isolated wall induces shrinkage, which increases when noncellulosic materials are removed before mercerization. The morphology and structure of the wall account for the observed behavior on mercerization, and electron micrographs of the mercerized wall show a shrunken network of cellulose fibrils. The primary wall resists disintegration by acid hydrolysis; its fibrillar pattern is intact, after long periods of contact with hot mineral acid. Long periods of heating in air "set" the primary wall in a configuration similar to that which it had on the corrugated surface of the cotton fiber. The contribution of the primary wall to certain gross properties of the fiber and its behavior during finishing treatments is discussed.

13 Tripp, V. W., and Giuffria, R.
CONCENTRIC CELLULOSE LAYERS IN COTTON FIBER CELL WALL. Textile Res. Jour. 24(8): 757-758. 1954.

In connection with studies of cellulose structure in untreated and modified cotton, electron microscopical observations have been made on ultrathin cross sections of fibers. Concentric cellulosic layers in the secondary wall of untreated cotton fibers were seen only with difficulty, if at all. Partially acetylated fibers swell when embedded by polymerization in a mixture of methyl and butyl methacrylates, and when the embedding medium is cautiously dissolved from the ultrathin sections of these fibers, concentric structures made up of cellulose fibrils are readily apparent. The fibrils composing the structures show strong lateral cohesion, and some 20-30 strata of the fibrils are present along any radius of the cell wall. The phenomenon may be useful for cell wall studies.

14 Weaver, J. W., Shirley [2], D. A., and MacKenzie [2], C. A.
ALKYLATION OF CELLULOSE WITH ESTERS OF p-TOLUENESULFONIC ACID. Indus. and Engin. Chem. 46(7): 1490-1493. 1954.

Preliminary work has established the optimum conditions for the methylation of cellulose with methyl p-toluenesulfonate and for the alkylation with other esters under these conditions. The reactivity of the p-toluenesulfonates with alkali cellulose dimished as the length of the alkyl group increased. The ethyl ester brought about a substitution of 1.0 group per glucose unit, while the propyl ester gave only 0.4 group. The butyl and phenyl esters were ineffective as etherification agents for cellulose. Etherification of cellulose with esters of p-toluenesulfonic acid is easier to control and requires less care than the usual laboratory preparation employing dimethyl sulfate.

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[2] Tulane University, New Orleans, Louisiana.

Mechanical processing

15 Cheatham, R. J., and Fiori, L. A.
EFFECT OF FIBER PROPERTIES ON PRODUCTS QUALITY AND PROCESSING EFFICIENCY. Fifteenth Amer. Cotton Congr. Proc. June 3, 4, and 5, 1954. Pages 35-46.

The Fibrograph for determining fiber length; the Pressley for measuring fiber strength; the Micronaire and Arealometer for the evaluation of fiber fineness, and the Causticaire method for determining fiber maturity, make it possible to obtain rapidly much more information than formerly on these fiber properties of different cottons and to correlate them with the properties of yarns. Both general relations and specific relations between fiber properties and yarn quality and processing efficiency are discussed.

*16 Kirkwood, Jr., C. E., Kendrick, N. S., and Brown, H. M. Contractor: Clemson School of Textiles, Clemson, S. C.
MEASUREMENT OF DIELECTRIC CONSTANT AND DISSIPATION FACTOR OF RAW COTTONS. Textile Res. Jour. 24(9): 841-847. 1954.

This research was part of a project on the cleaning and opening of cotton by the use of static electricity. Its objective was to determine whether there are differences between the dielectric constant and the dissipation factor for cottons and for those of trash. By use of a suitable capacitance bridge and special condenser, the dielectric constant and dissipation factor at a frequency of 200 kc./sec. were measured for several varieties of cotton and for several types of trash removed during processing. Measurements were made at 70°F. and at relative humidities of 45%, 55%, and 65%. Results are in fair agreement with those obtained by other workers. Information of this type is not only useful in determining the electrical characteristics of cotton and trash; but may be of value also in the determination of the trash content of cotton, possibly leading to some method of separating the trash from the cotton.

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* References marked with the asterisk are reports of work done by outside agencies under contract with U.S. Department of Agriculture, supervised by the Southern Utilization Research Branch.

No.

*17 Kirkwood, Jr., C. E., Bellamy, O. H., Kendrick, N. S., and Brown, H. M.
Contractor: Clemson School of Textiles, Clemson, S. C.
MEASUREMENT OF TRIBOELECTRIC RESPONSE OF RAW COTTONS. Textile Res. Jour. 24(9): 853-860. 1954.

By use of a novel commutator method, triboelectric potentials produced by rubbing cotton and various materials have been measured by comparison with known D. C. potentials. Results are given for fiberboard (phenolic resin laminate, fabric base), cork roller material, synthetic rubber roller material, Lucite, polystyrene, glass, and cellulose acetate sheet, used as rubbing materials on 3 varieties of cotton and on trash extracted from baled cotton. It does not seem that riboelectric methods can be used to distinguish between varieties of cotton, since generated voltages are so nearly the same. But since there is a considerable difference between the voltage generated on cottons and on trash by some rubbing materials (Fiberboard and cork roller material), it seems that practical use may be made of triboelectric methods to separate the trash from cottons.

18 Pettit, G. A.
APRON SPLICING DEVICE. U. S. Patent No. 2,694,436. November 16, 1954.

A device for splicing aprons on spinning frames etc. which is arranged so that both ends of the apron can be held in visual alignment before the clamping pressure is applied. The device consists of a frame arranged to extend above the roll of a spinning frame, clamps arranged to hold the ends of an apron which has been threaded around the roll, and a removable pressing device and backing plate, arranged to press the apron ends together until they are bonded by an adhesive.

*19 Wakeham, H., Virgin, W. P., and Spicer, N. Contractor: Textile Research Institute, Princeton, New Jersey.
COTTON QUALITY AND FIBER PROPERTIES. PART I: EFFECT OF MECHANICAL BLENDING ON COTTON FIBER PROPERTIES. Textile Res. Jour. 24(9): 802-809. 1954.

A serious problem in single-fiber testing is the preparation of a homogeneous sample from which fibers may be selected randomly. Mechanical blenders of the type developed for cotton by the U.S.D.A. greatly improved the homogeneity of a bulk fiber sample. This blender has been evaluated for the preparation of cotton fiber samples before single-fiber testing. Relatively small changes in mechanical behavior of the cotton fibers were observed as a result of blending. With the conventional three passes through the blender breaking load decreased (less than 10%) with corresponding changes in breaking stress and energy to break. Fiber crimp was reduced and fiber length slightly increased by the fiber array method. Whether these changes in fiber properties can be avoided by proper fiber manipulation has not yet been investigated.

Nc

Chemical processing

20 Baringer, K. L., Schuyten, H. A., and Goldthwait, C. F.
A BETTER WAY -- THROUGH RESEARCH -- TO KEEP DRY UNDER COTTON. (Research Finding No. 14). Textile Indus. 118(7): 102-105. 1954.

Research has been done at this Laboratory through use of water-repellent agents to improve cotton's resistance to penetration by rain and water; and on use of the capacity of wet cotton fibers to swell when wet and thus to close the pores of the fabric, producing self-sealing, water-resistant fabrics. In the water-repellent field, to obtain information on the theory of water-repellency, to explain the chemical reactions by which different agents produce the effect; 332 patents and articles published in the United States and England on water-repellent compounds have been reviewed. An unusual method of measuring water-repellency was devised. Research on swelling-type, self-sealing fabrics led to the development of an unlined (rubberless) firehose. Basic information on cotton fiber swelling has been obtained through application of microscopical techniques. Swelling of cotton has been compared to that of other fibers and the influence of varietal differences, fiber wall thickness, and degree of maturity on swelling, the influence of yarn and fabric construction and of finishing treatments has been studied. Water-resistant fabrics of this type have been produced.

21 Baringer, K. L.
A SUN-RESISTANT COTTON SHADE CLOTH WILL SAVE DOLLARS FOR TOBACCO FARMERS. The Progressive Farmer 69(11): 26. 1954.

A treatment of cotton shade cloth with lead chromate makes it durably sun-resistant. The chemical causes the damaging ultra-violet rays of the sun to become harmless. Lead chromate is inexpensive and can be applied to the cloth by simple processes. Treated cloth has lasted three seasons as top cover in Florida tobacco fields. At least two textile-finishing companies are producing the treatment cloth for sale. Shade-tobacco growers in Florida use about 25 million square yards of cotton shade cloth a year. Savings to tobacco farmers through use of improved cloth are estimated at about $200 per acre each season. The availability of the better cotton shade cloth lessens chances that some synthetics will encroach on cotton's market in this field.

22 Fisher, C. H.
RESEARCH TO TRANSFORM COTTON THROUGH CHEMISTRY INTO NEW TEXTILE PRODUCTS. Fourth Canadian Textile Seminar Proc. September 9-11, 1954. Also in Textile Mercury and Argus (3418): 639-640; (3419): 686-688. 1954.

Some methods that have been developed at this Laboratory and elsewhere for modifying cotton permanently with chemicals -- creating new textile products -- are described under these categories: (1) Treatments to effect changes in colloidal and physical properties; (2) use of fast dyes to impart new properties; (3) precipitation of insoluble materials in and on the fibers; (4) fibrous cellulose derivatives from cotton; (5) application of monomers followed by polymerization; and (6) application of polymers to cotton. Changes and improvements are effected without loss of natural fiber structure nor to any extent of desirable properties already possessed by cotton.

New textile products include a partly decrystallized cotton which is tougher, more extensible, more absorbent, and has greater dyeing capacity and greater chemical reactivity than ordinary cotton; a new type of cotton bandage of superior elasticity and clinging power, made by shrinking ordinary cotton gauze in strong caustic soda solution; an improved cotton tobacco shade cloth, which has a service life about 3 times that of untreated cloth and is being produced commercially; partially acetylated cotton being manufactured commercially for its heat endurance, and also highly resistant to micro-organisms, that cause mildew and rot; aminized cotton, carboxymethylated cotton, Cyanoethyl cotton has been studied here. The preparation of cotton treated with propiolactone has been extensively studied, but the evaluation has not proceeded to the stage that suitability for specific uses is known. Cotton cellulose has been oxidized with periodic acid.

Development of a monomer of the condensation type, called THPC, used in conjunction with methylolmelamine to prepare products having durable flame resistance and good resistance to rotting and wrinkling resulted from cooperative research with the Office of the Quartermaster. A process comprising application of a vinyl-type monomer (essentially a bromoalkyl allyl phosphate) to cotton followed by heating in the presence of a peroxide to cause polymerization has been used on a large experimental scale to produce flame resistance fabrics, also in cooperation with the Quartermaster.

*23 Fourt, L., Howorth, R. M., Rutherford, M. B., and Streicher, P.
Contractor: Harris Research Laboratories, Washington, D. C.
THE IMPROVEMENT OF LUSTER OF COTTON. PART VIII: SELECTION WITHIN COMMERCIAL VARIETIES ON THE BASIS OF FIBER PROPERTIES. Textile Res. Jour. 24(7): 685-694. 1954.

The possibility of improving the luster of cotton textiles by selecting the raw cotton on the basis of its fiber properties has been demonstrated. Such a method would enable spinners desiring the highest luster to select the most suitable raw cotton.

The Cotton Branch, Production and Marketing Administration, U.S.D.A., made available yarns from cottons representing a large part of the 1952 commercial crop. Low, middle, and high thirds of each of several varieties, on the basis of length, wt./in., maturity, or combinations of these properties were selected.

No.

*24 Fourt, L., and Elliott, H. J. Contractor: Harris Research Laboratories, Washington, D. C.
THE IMPROVEMENT OF LUSTER OF COTTON. PART IX: THERMOSETTING RESINS.
Textile Res. Jour. 24(8): 779-784. 1954.

Effects on the luster of cotton fabrics of typical commercial thermosetting resins, based on urea formaldehyde, melamine formaldehyde, and modifications of these, have been investigated, in terms of effects arising directly from the resins and of effects arising indirectly, through changes of fabric structure, made durable by the resins. Indirect effects appear to be as important as the choice of resins, if not more so.

Data show specifically comparative effects of the resins on mercerized and nonmercerized yarns and fabrics; effects of several variations of drying conditions and low-pressure mechanical smoothing; effects of laboratory embossing as compared to effects of tentering and ironing; and effects of resins on wrinkle recovery, stiffness, tensile strength, and tear strength.

25 Frick, Jr., J. G., and Weaver, J. W.
SUSPENSIONS OF POLYMERIC FLAMEPROOFING COMPOSITIONS CONTAINING PHOSPHATE AND HALOMETHYL GROUPS. U. S. Patent No. 2,686, 768, August 17, 1954.

A process of producing an aqueous emulsion flammability retarding agent which forms a laundry resistant polymer in and on textile fibers. An aqueous emulsion containing a polyhalomethane, such as bromoform, a polymerizable unsaturated phosphate, such as triallylphosphate, and an organic peroxide is heated at a temperature at which reaction occurs, until the emulsion contains suspended particles of a halogen and phosphorus containing polymeric addition product.

26 Frick, Jr., J. G., and Weaver, J. W.
"FLAMEPROOFING AQUEOUS SUSPENSIONS OF HALOMETHYLATED PHOSPHATES".
U. S. Patent No. 2,686,769. August 17, 1954.

A process of producing an aqueous emulsion flammability retarding agent which forms a laundry resistant polymer in and on textile fibers. An aqueous emulsion containing a polyhalomethane, such as bromoform, a polymerizable unsaturated phosphate, such as triallylphosphate, an organic perioxide, and an alkali metal bicarbonate buffer is heated at a temperature at which reaction occurs, until the emulsion contains suspended particles of a halogen and phosphorus containing polymeric addition product.

27 Hamalainen, C., Reid, J. D., and Berard, W. N.
THE USE OF OCTADECYL ISOCYANATE ON COTTON TO PRODUCE WATER-REPELLENCY.
Amer. Dyestuff Rptr. 43(15): 453-457. 1954.

No.

The possibility of reacting octadecyl isocyanate (ODI) with cellulose (to obtain a launder-resistant finish for cotton clothing) has been investigated, since such alkyl isocyanates have become available recently on a commercial scale.

Cotton cloth may be made superficially water-resistant by use of 2 to 5% of octadecyl isocyanate, in either organic solvents or aqueous emulsions, if the carrier liquid is evaporated and the treated fabric is then cured with heat, washed, and dried with heat. The extent of isocyanate esterification with cellulose was not determined. Apparently, a large part of the water-repellency is due to the formation of the highly insoluble dioctadecylurea by hydrolysis of the isocyanate. The finish is "shower-resistant" but would not be suitable for use in heavy rainstorms.

28 McMillan, O. S., and Guthrie, J. D.
PROCESS FOR MAKING FLAMEPROOFED DYED AMINIZED COTTON FABRICS.
U. S. Patent No. 2,695,833. November 30, 1954.

A process of producing flame resistant colored cellulosic textiles containing a laundry resistant coloring and flammability reducing agent which is chemically bonded to cellulose molecules. Aminized cellulosic textiles containing a specified amount of nitrogen are dyed with an acid dye containing phosphato or sulfato groups, such as the dye available under the trade name Kiton Fast Red, until the textile contains a specified amount of dyestuff chemically bonded to cellulose molecules.

29 Schreiber, W. T., Bullock, A. L., and Ward, W. L.
RESISTANCE OF PARTIALLY ACETYLATED COTTON FABRIC TO NITROGEN DIOXIDE AND TO HYDROGEN CHLORIDE. Textile Res. Jour. 24(9): 819-822. 1954.

The resistance of partially acetylated cotton to the tendering action of nitrogen dioxide is of interest because of the possible use of partially acetylated cotton filters for removing dusts from fume-laden air or for other purposes where resistance to oxidizing agents or to acids is required. A possible explanation of the protective effect of partial acetylation is that by substituting acetyl groups for the more accessible of the hydroxyl groups, these larger groups interfere with access of the gas to vulnerable groupings in the cellulose molecule. The protective action of acetylation against breaking of the cellulose chains is probably due to blocking of hydrolysis of the glycosidic linkages.

30 Schuyten, H. A., and Weaver, J. W.
THE DYEING OF CYANOETHYLATED COTTON. (Letter to the Editor.) Textile Res. Jour. 24(11): 1005. 1954.

No.

Methods employed in the dyeing of polyacrylonitrile fibers can be applied to cyanoethylated cotton of low substitution; and basic dyes that do not ordinarily dye cotton will dye cyanoethylated cotton. Acid dyes only slightly discolor untreated cotton, which is increased to an extremely light shade by the presence of cyanoethyl groups. The dyes are absorbed to only a negligible extent by cyanoethylated cotton with substitutions as high as 1 cyanoethyl group per anhydroglucose unit (6.5%N).

Bibliographical

*31 Langston, J. H., and Rainey, Jr., W. T. Contractor: School of Textiles, Clemson Agricultural College, Clemson, S. C.
A LITERATURE SURVEY ON FIBER FRICTION. Textile Res. Jour. 24(7): 644-653. 1954.

Data contained in 137 references pertinent to the subject of increasing the friction of cotton fibers, bearing on the subject either directly or by analogy, have been summarized. Most of the material was located through a search of the following sources, either in their entirety or from 1905 to August 1953: Chemical Abstracts, Industrial Arts Index, Journal of Textile Institute (Abstracts), Textile Research Journal (Abstracts), and Textile Technology Digest. References have been reviewed under these main categories: (1) Measurement of frictional properties (1 to 34 references); (2) frictional properties of cellulosic fibers (35 to 59 references); (3) Modification of fiber friction (60 to 137 references). Under this third classification are discussed colloidal silica; other silicon compounds; abrasives; resins; and metallic salts.

32 Worner, R. K., and Skau, D. B.
LITERATURE ON THE NATURAL FIBERS. Advances in Chemistry, Ser. No. 10. "Literature Resources for Chemical Process Industries": 172-190. 1954.

The literature on natural fibers is reviewed and an extensive bibliography provided. References are discussed according to subject classification and varieties of fibers; nomenclature; treatises, monographs, and reviews containing general information; and sources of information on specific fibers. Also discussed are abstracting and indexing services; bibliographies, reading lists, and library catalogs; periodical lists; and sources of miscellaneous information.

OILSEEDS AND OTHER OIL-BEARING MATERIALS

Properties and composition

33 Benerito, R. R., Singleton, W. S., and Feuge, R. O.
SURFACE AND INTERFACIAL TENSIONS OF SYNTHETIC GLYCERIDES OF KNOWN COMPOSITION AND CONFIGURATION. Jour. Phys. Chem. 58(10): 831-834. 1954.

No.

To understand better the fundamental theory and practical applications of fat emulsions, a precise knowledge of the surface tension at various temperatures and the interfacial tensions against water of pure synthetic glycerides was desired. The semi-micro method of Ferguson was modified slightly. From the surface tension-temperature data, enthalpy and entropy changes in the surface formation were calculated, and equations developed by the least squares method. For the simple triglycerides containing an even number of carbon atoms the variation of enthalpy and entropy changes with the number of carbon atoms per acid radical is shown graphically. Synthetic glycerides of known configuration were selected to show effects of degree of unsaturation, degree of esterification, and cis-trans isomerism on the surface phenomena.

34 Boucher, R. E., and Skau, E. L.
SOLUBILITY CHARTS FOR HOMOLOGOUS LONG-CHAIN ORGANIC COMPOUNDS. A COMPREHENSIVE GRAPHICAL CORRELATION OF LITERATURE DATA FOR 138 SYSTEMS INVOLVING 11 HOMOLOGOUS SERIES AND 17 SOLVENTS. U.S.D.A., ARS Mimeograph No. ARS-72-1: 7 pp. ≠ 138 charts. 1954.

The charts here presented constitute a comprehensive critical review of the published solubility data for 138 systems involving 11 homologous series and 17 different solvents. Such plots have applications in connection with data on the solubilities of members of homologous series. They can be used to smooth out the experimental solubility data, to locate descrepancies caused by experimental error or by an impurity in one sample in the series, and to predict by graphical interpolation or extrapolation the solubility of missing members of the series. (See ARS-72-3 Jan.-June 1954, item No. 33.)

35 Hogan, J. T., Larkin 3/, R. A., and MacMasters 3/, M. M.
CEREAL QUALITY MEASUREMENT-X-RAY AND PHOTOMICROGRAPHIC EXAMINATION OF RICE. Agric. and Food Chem. 2(24): 1235-1239. 1954.

X-ray techniques have been used successfully for the rapid examination of rough (unhulled) rice for cracks, checks, insect damage, and immature seed. Radiographic evidence of cracks (or checks) in grains of rough rice was confirmed by photomicrographs of halves of the same kernels. Improved techniques were used in the preparation of thin sections of rice kernels for study of the detail of the inner structure of the kernels. Quality factors, such as yields of head rice, color, stability to oxidation, and nutritive value, are related to the structural elements of the rice kernel that remain in the milled rice.

3/ Northern Utilization Research Branch, U. S. Department of Agriculture, Peoria, Illinois.

No.

36 Hopper, T. H.
COTTONSEED. Encyclopedia Britannica, Vol. 6: pages 583-585.
Encyclopedia Britannica, Inc., Chicago, Ill. 1954. (Revision of article by D.F.J. Lynch, Encyclopedia Britannica, Vol. 6, pages 584-586, 1944.)

This article traces the development of the use of cottonseed as a source of oil, meal, linters, and hulls. This development parallels almost wholly a history of the development of the cottonseed industry in the United States. The processing of cottonseed to recover products and the use of these products are briefly described. Recent statistics are given on the production and value of cottonseed and cottonseed products for the United States.

37 Pack, F. C., Moore, R. N., and Bickford, W. G.
STABILIZATION OF VINYL RESIN MONOMERS. U. S. Patent No. 2,685,597.
August 3, 1954.

A method of stabilizing vinyl resin monomers against heat or light induced polymerization during their preparation, storage, etc. The monomers, such as styrene, methyl acrylate, or vinyl acrylate are mixed with a small amount of gossypol or dianilino gossypol.

Processing and storage

38 D'Aquin, E. L., Pominski, J., Molaison, L. J., and Vix, H. L. E.
PROCESS FOR THE PRODUCTION OF SUBSTANTIALLY SKIN-FREE PEANUT KERNELS.
U. S. Patent No. 2,687,155. August 24, 1954.

This is a method of blanching peanuts so that substantially all of the skins are removed, to produce a color-free source of peanut protein. Peanuts are immersed in water until they absorb a specified amount, the moist peanuts are dried at a moderate temperature until they have a specified moisture content, and the peanuts so-treated are blanched in the usual manner.

39 D'Aquin, E. L., Spadaro, J. J., Graci, Jr., A. V., Eaves, P. H., Molaison, L. J., Knoepfler, N. B., Crovetto, A. J., Gardner, H. K., and Vix, H. L. E.
PILOT-PLANT APPLICATION OF FILTRATION-EXTRACTION TO SOYBEANS.
Amer. Oil Chem. Soc. Jour. 31(12): 606-613. 1954.

Filtration-extraction has been satisfactorily applied to the processing of soybeans in seven pilot plant runs in which several procedures of preparation for extraction were evaluated. Procedures are recommended for the preparation of cooked and uncooked flakes. The choice of one method of preparation over the other would depend on the particular processor, the equipment on hand, and upon oil and meal quality considerations, among other criteria.

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40 Decossas, K. M., Molaison, H. J., and Pollard, E. F.
A NEW BATCH SOLVENT EXTRACTION PLANT. Amer. Oil Chem. Soc. Jour. 31(8): 338-341. 1954.

An all-stainless steel, batch solvent-extraction pilot plant has been designed, constructed, and tested at this Laboratory. This new improved batch solvent-extraction plant and its versatility of design are described. Data are given on the cost and initial test operations. The performance of the plant and its value as a research tool has been demonstrated by the production of free gossypol and meals low in gossypol for use in research. Only one operator is needed.

41 Gastrock, E. A., Spadaro, J. J., Gardner, H. K., Knoepfler, N. B., and Molaison, L. J.
CURRENT STATUS OF THE FILTRATION-EXTRACTION PROCESS FOR COTTONSEED AND OTHER OLEAGINOUS MATERIALS. Oil Mill Gazetteer 59(2): 40-41. 1954.

Early claims for this solvent process (see Lists, AIC-319, Supplement 1, item 39; Supplement 2, item 30; Supplement 3, items 26, 27, 29) have been equalled or bettered by commercial operations at the Greenwood, Mississippi, plant, processing soybeans and cottonseed. Further bench-scale work is being conducted on application of the process to rice bran, soybeans, cottonseed, flaxseed, peanuts, and some has been done on milo germ and sesame; pilot-plant work is underway on rice bran, soybeans, cottonseed, flaxseed and milo germ. A summary is given of the various processing operations in the filtration-extraction process and some general conclusions regarding the variable encountered and steps to be taken for controlling them.

42 Holzenthal, L. L., Gastrock, E. A., Pollard, E. F., Molaison, H. J., Gentry, Jr., W. T., Martin, C. T., and Crovetto, A. J.
PROGRESS REPORT ON CLEANING COTTONSEED. Oil Mill Gazetteer 59(5): 14-16. 1954.

Two devices for cleaning cottonseed are described in this fourth progress report; one for removal of "sticks" or stems and the other for removal of all foreign material. Although exploratory data on the latter device are incomplete, indications are that removal of substantially all trash from cottonseed may be achieved through this approach.

43 Kulkarni [4], B. S., Graci, Jr., A. V., and Vix, H. L. E.
FILTRATION-EXTRACTION: A NEW COMMERCIAL CONTINUOUS SOLVENT EXTRACTION PROCESS FOR EXTRACTION OF OLEAGINOUS MATERIALS. Oils and Oilseeds Jour. 7(3): 5-11. 1954.

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[4] Department of Chemical Technology, Osmania University, Hyderbad, India.

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Briefly described is the case-history of a novel solvent extraction process from its conception to its operation on a commercial scale. Main advantages of the new process over the conventional processes are summarized. Typical plant data have been included to confirm successful operation and some of the novel design features of the process are illustrated.

44 Pominski, J., Eaves, P. H., Vix, H. L. E., and Gastrock, E. A.
SIMULTANEOUS RECOVERY OF WAX AND OIL FROM RICE BRAN BY FILTRATION-EXTRACTION. Amer. Oil Chem. Soc. Jour. 31(11): 451-455. 1954.

Hard rice waxes of high melting points have been obtained directly from rice bran while simultaneously producing oil by these two methods: Selective cold hexane-extraction of cooked rice bran to remove the oil, hot hexane-extraction to remove the wax, chilling of the hot miscella and separation of the precipitated wax by centrifugation; single hot hexane-extraction of raw or cooked rice bran, hot water-washing and chilling of the miscella, separation of the wax precipitate by settling or centrifugation, and multiple cold hexane-washings of the wax. Wax can also be processed from rice oil settlings by the latter method after a miscella has been prepared. The cold extraction-hot extraction method should be preferable as a process when conducted on a single continuous filtration-extraction unit without reslurrying. Indications are that oil refining losses may be decreased by this method. Yields of rice wax varied from 0.22 to 0.31% of the original rice bran, or 1.29 to 1.82% of the extracted oil.

45 Spadaro, J. J., and Graci, Jr., A. V.
FILTRAXIONE-ESTRAXIONE: UN NUOVO PROCESSO DI ESTRAXIONE DIRETTA CON SOLVENTI DEI MATERIALI OLEOSI (FILTRATION-EXTRACTION: A NEW DIRECT SOLVENT EXTRACTION PROCESS FOR OLEAGINOUS MATERIALS) Olii Minerali, Grassi, Colori e Vernici. N. 6: 1-16. 1954.

This is an illustrated article giving details of procedures, equipment, results, and advantages, with filtration-extraction of cottonseed, rice bran, and soybeans.

46 Teunisson, D. J.
YEASTS FROM FRESHLY COMBINED ROUGH RICE STORED IN A SEALED BIN. Applied Microbiol. 2(4): 215-220. 1954.

The greatest changes in microbial populations in two lots of freshly combined rough rice stored in a sealed bin were an inhibition of mold growth and a marked proliferation of yeasts. The types of yeasts isolated from the rice stored 7 months were Endomycopsis chodati (Nechitch) Wickerham and Burton, Hansenula anomala (Hensen) Sydow, and Pichia farinosa (Lindner) Hansen. Those found in the rice stored 34 days were E. chodati, Canadida krusei (Cast.) Berkhout, Oospora lactis

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(Fres.) Sacc., Candida tropicalis (Cast.), and Hansenula anomala. The results obtained suggest that the yeasts are potential spoilage agents of stored rough rice and that they could produce off-flavors and odors in stored rice. The souring of rice in the sealed bin for the periods used is apparently similar to the fermentation of silage.

47 Teunisson, D. J.
INFLUENCE OF STORAGE WITHOUT AERATION ON THE MICROBIAL POPULATIONS OF ROUGH RICE. Cereal Chem. 31(6): 462-474. 1954.

Combine-harvested rice, air-dried to 14.3% moisture or less, contained moderate to large numbers of molds, aerobic bacteria, and anaerobic organisms; low to moderate numbers of actinomycetes; and relatively few yeasts. Rice with 18 to 20% moisture, sealed in a glqss-lined bin for 7 months in one trial and 34 days in another, became sour. Some molds survived but did not increase; aerobic bacteria survived or decreased in numbers; the facultative anaerobic organisms markedly increased; and the yeasts increased tremendously in most of the layers of the piles of rice. There was a loss in seed viability. Critical heating of the rice did not occur. Other lots with 21.5 to 32.4% moisture, stored in sealed containers in the laboratory, showed the same general changes except that the aerobic organisms often increased.

48 Thurber, F. H., Vix, H. L. E., Pons, Jr., W. A., Crovetto, A. J., and Knoepfler, N. B.
THE EFFECT OF PROCESSING CONDITIONS ON THE PROPERTIES OF SCREW-PRESS COTTONSEED MEAL AND OIL. Amer. Oil Chem. Soc. Jour. 31(9): 384-388. 1954.

Four mill-scale studies are reported which were undertaken to produce quantities of low temperature dry-cooked meals and to obtain information that may aid in developing processing conditions which will retain certain desirable features of both low temperature dry-cooking and high temperature moist-cooking. Cooking meats at 240-250°F. produced meals with low free gossypol content but at the expense of considerable protein damage. The resultant crude oils showed some color reversion upon storage at 95°F. Dry cooking (7% moisture) at temperatures not exceeding 200°F. gave meals of improved chemical properties, but the crude oils exhibited considerable color reversion on storage. Wet low-temperature cooking (200-210°F.), followed by evaporative cooling, yielded a meal intermediate in quality between that for normal mill practice and dry low-temperature cooking. The crude oils, which corresponded to hydraulic-pressed oil, did not exhibit any appreciable color reversion upon storage at elevated temperatures. The increase in the bleach color of crude oils stored at 95-100°F. was directly related to the initial gossypol content of the crude oils. Nutritional studies on the meals were made by cooperating laboratories and are being reported separately.

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*49 Wamble, A. C., and Harris, W. B. Contractor: Texas Engineering Experiment Station, Texas A. & M. College, College Station, Texas.
SCREW PRESSING OF COTTONSEED. Tex. Engin. Expt. Sta. Bul. No. 136: 75 pp. September 1954.

It was attempted to contribute more fully to the understanding of screw press operations and to explore the possibilities of their improvement. All work was carried out under controlled conditions, including full scale operations in a manner applicable to commercial practice to determine: The work has shown the effects of many variables in the process. The main variables for each step have been analyzed with regard to their effects upon extraction efficiency, quality of products, and other pertinent factors. Methods of improving oil yield, capacity, and all around performance are described and the results projected as general principles for mill operation to guide anyone who is considering or using screw press extraction in comparison with other extraction methods.

Glyceridic oils and fatty acids

50 Dechary, J. M., Kupperman, R. P., Thurber, F. H., and O'Connor, R. T.
THE PIGMENTS OF CRUDE COTTONSEED OILS. I. THE INHIBITION OF COLOR REVERSION IN CRUDE COTTONSEED OILS. Amer. Oil Chem. Soc. Jour. 31(10): 420-424. 1954.

Treatment of freshly prepared crude cottonseed oils with p-aminobenzoic acid and subsequent removal of the di- p-carboxyanilinogossypol formed makes it possible to store the oils at 37-38°C. for 30 days without incurring any adverse changes in the refining and bleaching properties of the oils. Refining loss of the crude oil is considerably decreased, and the stability of the bleached oil is not affected by the treatment. Spectrophotometric studies show that the p-aminobenzoic acid removes almost completely the gossypol-like pigments which are present in the crude oils and yields oils having the characteristic carotenoid spectrum.

51 Gros, A. T., and Feuge, R. O.
CONSISTENCY OF FATS PLASTICIZED WITH ACETOGLYCERIDES. Amer. Oil Chem. Soc. Jour. 31(9): 377-383. 1954.

Several normally liquid, natural oils were modified by ester interchange or glycerolysis and acetylation to produce acetoglycerides. An aceto-olein product was also prepared from commercial oleic acid. These products, together with two similar products obtained from a commercial firm, were tested to determine their ability to plasticize fats. Margarine-like products of wide plastic range could be prepared by acetylating lard and cottonseed, soybean, and peanut oils to an acetyl content ranging from about 12 to 20%. Simple addition of acetoglycerides to commercial margarine oil does not result in any improvements. Addition of an acetoglyceride-hard fat mixture improved the plastic range, provided addition was at a level of about 50%. A mixture of hard fat and peanut oil acetylated to a limited degree was found to have a much longer plastic range than did commercial margarine oil, and the consistency of the mixture was relatively constant over the temperature range of 15° to 30°C. Small amounts (1 to 8%) of aceto-olein product incorporated in highly hydrogenated cottonseed oil were effective in reducing the hardiness of the latter when it was cast in block form.

52 Markely, K. S., and Feuge, R. O.
PROCESS FOR ALKALI-REFINING CRUDE NATURAL OILS. U. S. Patent No. 2,686,796. August 17, 1954.

This is a method of alkali-refining crude natural glyceride oils so that the color reduction is increased without increasing refining loss. A mixture of the oil and the amount and type of aqueous alkali usually employed is briefly exceedingly violently agitated. This agitation shears the liquids, and the mixture is processed in the usual manner.

53 Morris, N. J., and Freeman, A. F.
PEANUT BUTTER. VI. THE EFFECT OF ROASTING ON THE PALATABILITY OF PEANUT BUTTER. Food Technol. 8(8): 377-380. 1954.

Peanut butters prepared in the pilot plant from peanuts roasted to various extents were evaluated periodically to determine the effect of extent of roasting accorded the peanuts on flavor characteristics during two years' storage. Taste panel data show that in the opinion of the panel peanut butters from medium roasted peanuts exhibited the most desirable flavor and good flavor retention.

54 Skau, E. L.
PROCESS FOR MODIFYING GLYCERIDIC FATS AND OILS. U. S. Patent No. 2,684,377. July 20, 1954.

This is a method of winterizing a peanut oil by a solvent fractional crystallization process that avoids the gelation characteristic of peanut oils. The oil is dissolved in enough acetone and hexane to produce a solution of specified proportions; the solution is cooled to a specified temperature at which some of the higher melting glycerides solidify; and the solidified glycerides are centrifugally isolated from the solution.

55 Skau, E. L.
PROCESS FOR FRACTIONATING GLYCERIDIC MIXTURES OBTAINED AS HYDROCARBON SOLUTIONS. U. S. Patent No. 2,684,378. July 20, 1954.

This is a method of winterizing a cottonseed oil by a solvent fractional crystallization process that avoids the phase separation characteristic of cottonseed oil in moist solvents. The oil is dissolved in enough

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acetone and hexane to produce a solution of specified proportions; the solution is cooled to a specified temperature at which some of the higher melting glycerides solidify; and the solidified glycerides are centrifugally isolated from the solution.

56 Willich, R. K., and Freeman, A. F.
CONTINUOUS ENRICHMENT OF PEANUT BUTTER WITH VITAMIN A. Food Engin. 26(8): 129, 131, 166. 1954.

Equipment for the continuous delivery of materials required in the manufacture of peanut butter fortified with vitamin A has been described. Results of measurements with this equipment of the rates of delivery of roasted peanuts, hydrogenated peanut oil, salt, and peanut oil to serve as a carrier for vitamin A indicated a high degree in uniformity of delivery. No significant changes in rate of delivery were found upon reduction of the "head" or supply of material contained in the hoppers.

57 Willich, R. K., Morris, N. J., O'Connor, R. T., and Freeman, A. F.
PEANUT BUTTER. VIII. EFFECTS OF PROCESSING AND STORAGE ON VITAMIN A INCORPORATED IN PEANUT BUTTER. Food Technol. 8(8): 381-384. 1954.

The effects of processing temperatures and conditions of storage on the vitamin A palmitate incorporated in peanut butter have been investigated. While no significant losses could be attributed to temperature only, a definite but small loss in vitamin A may be attributed to the inclusion of atmospheric oxygen, and to frictional heat produced in the manufacture of the product. The content of vitamin A incorporated in peanut butter remained satisfactorily high, although reduced, after storage of the product for 6 months at either 80° or 100°F.

Meals and proteins

58 Condon, M. Z., Jensen [5], E. A., Watts [6], A. B., and Pope [6], C. W.
EFFECT OF AUTOCLAVING IN PRESENCE AND ABSENCE OF GOSSYPOL ON SOLVENT EXTRACTED COTTONSEED MEAL. Agr. & Food Chem. 2(16): 822-826. 1954.

Before the processing conditions in cottonseed oil mills can be modified to produce meals of consistently high nutritional quality, the individual effects of heat and of bound gossypol must be understood. This investigation was undertaken to determine the effect of autoclaving in the presence and absence of gossypol on certain chemical and nutritive properties

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[5] National Cottonseed Products Association. [6] Agricultural Experiment Station, Louisiana State University.

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of a cottonseed meal of initially high quality. Chick feeding experiments indicated a progressive decrease in the protein quality index of the meals as time of autoclaving increased. This reduction was paralleled by similar decreases in solubility of nitrogen of the meals in 0.02N sodium hydroxide. There appeared to be no direct relation between any other property of the meals and their nutritive value to chicks. Samples to which 1% gossypol was bound during autoclaving appeared to be equivalent, chemically and nutritionally, to control samples autoclaved for the same time.

General

59 Altschul, A. M.
UTILIZATION RESEARCH ON PEANUTS. Peanut Jour. and Nut World. 33(9): 11, 12, 39. 1954.

There is a surplus of peanuts in the United States -- about 62 million pounds in 1954. Utilization research is the most promising approach towards meeting this problem. The status of research on peanuts at this Laboratory is reviewed. It is mentioned that 92 publications have been issued on this research. A conference held at this Laboratory attended by representatives of the industry and researchers of various agencies indicated that research would be done to improve the quality of peanuts.

60 Kime, J. A.
OILSEED RESEARCH AT SRRL: A PROGRESS REPORT. Oil Mill Gazetteer 59(2): 34-37. 1954.

The major emphasis in oilseed research is on cottonseed, but research is underway also on peanuts, tung, and minor oil-bearing substances such as sesame and rice bran. Major lines of research on cottonseed have been as follows: Composition and properties of seed, as affected by environment and variety; laboratory-scale investigations of cooking; cooperative program to extend use of meal into poultry and swine feeds; development of laboratory test to measure nutritive value of meal; production of lighter-colored oils; development of aceto and other modified glycerides for food and nonfood use; new industrial products from cottonseed oil fatty acids; technical assistance to the industry in the commercial application of the filtration-extraction process; processing research to improve hydraulic and screw pressing methods, and improvement in methods of cleaning cottonseed and linters at oil mills. The major effort is on problems associated with food utilization of peanuts: Fundamental study of the constituents involved in staling. Optimum conditions for the production of high-quality peanut butter have been established. Development of new methods of utilizing tung oil in protective coatings and of new industrial products based on the unique structure of tung oil fatty acids is sought.

No.

MISCELLANEOUS

61 Hoffpauir, C. L.
REPORT ON STARCH IN PLANTS. COLLABORATIVE STUDY OF ANTHRONE PROCEDURE.
Assoc. Off. Agr. Chem. Jour. 37(3): 716-718. 1954.

Previous reports have described the application of the anthrone-sulfuric acid reagent to the determination of starch in plant materials (1, 2). This method has been studied collaboratively in accordance with last year's recommendation. Samples of alfalfa leaf meal, buckwheat leaves, and peanut meal were ball-milled to pass a 100-mesh sieve and allowed to come to moisture equilibrium before distribution. The collaborators were requested to report for each sample two independently determined sets of duplicate values for starch by the modified procedure and also moisture values. It is recommended that the anthrone procedure be submitted to further critical study.

62 O'Connor, R. T., and Goldblatt, L. A.
CORRELATION OF ULTRAVIOLET AND INFRARED SPECTRA OF TERPENE HYDROCARBONS. Analyt. Chem. 26(11): 1726-1737. 1954.

Various types of structures of terpene hydrocarbons are readily distinguished by their ultraviolet spectra and this fact may serve as a basis for preliminary characterization. In some cases established rules of ultraviolet absorption, coupled with a limited number of physical characteristics, permit positive identification of a known terpene or provide a direct guide to the structure of an unknown terpene. In the "group frequency" region of the infrared (about 2 to 9 microns) correlations of certain absorption bands with vibrating groups which give rise to them show how the presence or absence of specific groups can be ascertained. The "fingerprint" region (9 to 12 microns) is characteristic of each type of molecule. Individual terpene hydrocarbons can be identified by direct comparison of their spectra in this region with spectra of standard reference compounds. The combination of ultraviolet and infrared spectra may be used to identify and determine the terpene hydrocarbons in various distillate fractions, especially those derivable from turpentine.

SUGARCANE AND DERIVED PRODUCTS

Properties and composition

63 Balch, R. T., and Friloux, J. J.
THE STARCH CONTENT OF SUGARCANE PRODUCTS: 1952 AND 1953 SEASONS.
Sugar Jour. 17(5): 22-24. 1954.

The starch content of sugarcane is closely related to the physiological activity of the plant and is thus affected by conditions which govern

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this activity; starch gradually disappears from cane whose synthesizing powers are depressed or largely destroyed, as by freezing injury. Varieties exhibit different characteristics in respect to their starch content; the present commercial varieties grown in Louisiana contain a medium amount of starch. Starch is not eliminated in defecating juices by Louisiana practices. From 15 to 25% of the starch in sirup is taken up by the sugar crystals during their growth. The ratio of starch in washed raw sugar to that found in the original sugar was 0.81, showing that affirmation removes mostly that portion which is contained in the molasses film adhering to the crystals.

64 Fort, C. A., and Smith, B. A.
STUDIES OF THE CHEMICAL COMPOSITION OF MATERIALS CAUSING TURBIDITY IN CLARIFIED SUGARCANE JUICES. Sugar Jour. 17(6): 18-21, 32. 1954.

Clarified juices of widely varying turbidity were subjected to high speed centrifuging, and the amount and composition of the sediments obtained were studied. The total sediments ranged from 0.18 to 0.72% on dry juice solids, or from 0.45 to 1.80 pounds per ton of cane. Organic substances predominate, averaging 72%. About two-thirds of this organic material was analyzed to be lipids, protein, and starch; the other one-third was not identified. The major portion of the ash or mineral portion of the sediment was siliceous. The non-silica fraction of the minerals contained iron, aluminum, calcium, magnesium, and phosphorous.

65 Roberts, E. J., Martin, L. F., Magne, F. C., and Mod, R. R.
ACONITIC AND TRICARBALLYLIC ACID ESTERS AS VINYL PLASTICIZERS. Rubber World 130(6): 801-804. 1954.

Esters of aconitic acid and mixed esters of the corresponding tricarballylates obtained by hydrogenation of the aconitic acid esters have been prepared using alcohols ranging from propyl to octyl. These esters have been screened for use as plasticizers for polyvinyl chloride acetate plastic, and the results indicate that some of them may be used in place of di-2-ethyl hexyl phthalate plasticizer.

Processing

66 Guilbeau, W. F., Lipps, Jr., J. G., and Martin, L. F.
SUGARCANE PROCESSING. CLARIFICATION OF NEW VARIETIES OF CANE ON A PILOT PLANT SCALE. Agr. and Food Chem. 2(18): 941-946. 1954.

This research provides data on the suitability of new sugarcane varieties for sugar production before they are grown on a commercial scale. Equipment and procedures were developed for grinding and processing individual 2-ton samples of cane on a pilot plant scale. The study of

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clarification of 7 new varieties and a widely grown commercial standard on this scale provided information on the relative quantities of precipitate formed, filterability of the precipitates, and clarities of the juices. Significant differences in the performance of these new varieties were established, and were considered together with the results of agronomic field testing in deciding to release two of them for commercial use. Further field testing of one of the less promising new varieties was discontinued when it was established that juice from this cane would be extremely difficult to clarify.

67 Martin, L. F., Guilbeau, W. F., and Lipps, Jr., J. G.
SUGAR YIELDS, SUGAR RECOVERIES, AND THE FUTURE OF OUR LOUISIANA INDUSTRY. Sugar Bul. 32(22): 371-373. 1954.

There is the steadily increasing difference between yields and recoveries of sugar. There has been no significant increase or decrease in the pounds of sugar available per ton of cane, yet the recoveries of 96° raw sugar per ton of cane have continued generally downward. The sugar that is not recovered is being lost in increasing amounts in molasses, in bagasse, and in press cake. If the present trend should continue we can expect that only 70% of the available sugar will be recovered in 1956, rather than 80%, which was recovered in 1939. One line of work with the objective of remedying the situation is the evaluation of new varieties on a pilot plant scale to ensure the introduction of only such new canes as are known to have good milling, clarification, and processing characteristics, at least when they are delivered to the factories in reasonably clean and fresh condition.

68 Stewart 7/, C. W., and Guilbeau, W. F.
EVALUATION OF SUGARCANE VARIETY N. CO. 310 FOR MILLING AND PROCESSING. The Sugar Bul. 32(19): 295. 1954.

Four examples of N. Co. 310 variety of sugarcane in 1952-53 grinding season and 4 samples in the 1953-54 season were evaluated in milling and juice-processing experiments. Average results showed a grinding rate and juice-processing performance slightly better than those of a standard variety. The purity of N. Co. 310 juice was higher, and the indicated theoretically available sugar per ton of cane was 107.0% of that of the standard cane.

7/ Superintendent, Audubon Sugar Factory, Louisiana State University, Baton Rouge, Louisiana.

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FRUITS AND VEGETABLES

Citrus

69 Griffiths, F. P., and Jones, M. A.
RESEARCH INDICATES NEW TRENDS IN CITRUS PROCESSING. In "Building the Citrus Industry of the Lower Rio Grande Valley". Published by United Citrus Growers, Pharr, Texas. pp. 21, 23. November 1954.

A satisfactory method of processing pink and red grapefruit unsalable in the fresh state is the most pressing problem of the citrus canning industry in the Lower Rio Grande Valley of Texas. Two methods are being explored. Two other grapefruit products have been studied -- a frozen concentrate, and a concentrate to keep at temperatures of 40°F. or higher. Frozen limeade base also appears to have possibilities.

70 Lime, B. J., Stephens, T. S., and Griffiths, F. P.
PROCESSING CHARACTERISTICS OF COLORED TEXAS GRAPEFRUIT. I. COLOR AND MATURITY STUDIES OF RUBY RED GRAPEFRUIT. Food Technol. 8(12): 566-569. 1954.

To process juice from colored grapefruit successfully, more information was necessary about the development of color, and its relation to maturity. For opening studies on this problem the Ruby Red was selected because it is probably the most widely planted of the colored varieties in Texas. Measurements of color and some chemical and physical characteristics were made at intervals of 2 weeks for about 8½ months. These measurements included visual and reflected color; average weight; Brix, acid, naringin, lycopene, and carotene content. Color was strongest early in the season, before fruit reached its peak of processing quality, and had begun to fade when this peak had been reached. These studies indicate that the combination of good color with high flavor characteristics is limited to a relatively short period.

Cucumbers

71 Etchells, J. L., Costilow [8], R. N., Bell, T. A., and Demain [8], A. L.
CONTROL OF MOLDS DURING THE ENUMERATION AND ISOLATION OF YEASTS FROM SOIL AND PLANT MATERIAL. Appl. Microbiol. 2(5): 296-300. 1954.

Three levels of sodium propionate and three levels of diphenyl in acidified dextrose agar and acidified dextrose agar with 5% salt were tested for their ability to restrict mold growth yet permit the rapid growth of yeasts from soil samples. No level of diphenyl tested in acidified dextrose agar inhibited mold growth satisfactorily, and the use of 0.02% of this agent resulted in marked inhibition of the yeasts. Acidified dextrose agar plus 0.35% sodium propionate was the most effective medium tested in separating yeasts from molds in soil samples. However, this chemical, even in low concentrations, greatly inhibited the growth of Endomycopsis ohmeri and completely inhibited Rhodotorula flutinis. Furthermore, the use of propionate agar resulted in very low yeast counts in samples of plant material as compared to the populations obtained with acidified dextrose agar and synthetic agar. Acidified synthetic agar proved to be the medium of choice for the enumeration and isolation of yeasts from plant material.

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[8] North Carolina Agricultural Experiment Station, Raleigh, North Carolina.

72 Jones 9/, I. D., Etchells, J. L., and Monroe 9/, R. J.
VARIETAL DIFFERENCES IN CUCUMBERS FOR PICKLING. Food. Technol.
8(9): 415-418. 1954.

The suitability of 19 varieties and strains of cucumbers for salt-stock production were evaluated over a 3-year period at a commercial pickling plant. Differences of a magnitude considered commercially important are reported.

Sweetpotatoes

73 HALL 10/ H. H., Etchells, J. L., Jones 9/, I. D., and Lewis 11/, W. M.
MICROBIOLOGICAL AND CHEMICAL STUDIES OF SWEET POTATO VINE SILAGE.
Jour. Dairy Sci. 37(11): 1325-1336. 1954.

Sweetpotato vines and combinations of vines, tubers, and molasses were ensiled during consecutive years in glass jars and wooden barrels. There resulted under each condition an acid-type fermentation with the production of silage having good odor, color, and texture. During the most active phase of the fermentation, the population of acid-forming bacteria, which was mainly L. plantarum, increased rapidly from 150 to 600 million per gram of silage in about 5 days. Although the population of acid-forming bacteria varied from year to year, their numbers were not greatly influenced by the addition of sweetpotato tubers or molasses to the vines. Chemical changes during the fermentation were evidenced by a drop in pH, a decrease in the sugar content, and the formation of lactic acid. The addition of tubers and molasses to vines increased the amount of acid formed, over vines alone, except

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9/ North Carolina Agricultural Experiment Station, Raleigh, North Carolina.

10/ Northern Utilization Research Branch, Peoria, Illinois.

11/ Biology Department, Southern Illinois University, Carbondale, Illinois.

one year when low temperatures prevailed throughout the active fermentation phase. Analysis of data on techniques shows different sources of experimental error to be 6% for plating and sampling, 50% for samples taken repeatedly from the same barrel, and 15% for samples taken each time from different barrels.

PINE GUM AND DERIVED PRODUCTS

Turpentine

74 Schmidt, G. A., and Fisher, G. S.
TERPENE HYDROPEROXIDES. IV. THE THERMAL DECOMPOSITION OF PINANE HYDROPEROXIDE. I. Amer. Chem. Soc. Jour. 76(21): 5426-5430. 1954.

The thermal decomposition of pinane hydroperoxide has been studied. A ketone $C_{10}H_{18}O$ has been obtained in yields of 20% by weight of the hydroperoxide used. The structure of this ketone has been proved by unequivocal syntheses and infrared data to be 2,2-dimethyl-3-ethylacetylcyclobutane. The effects of oxygen and pinane on the ketone formation have been studied. It has been found that the change in the reductive capacity of the decomposition mixture containing the hydroperoxide by the addition of pinane increased the yield of ketone by 100%. The change of the oxidative capacity of the mixture with the addition of oxygen did not alter the yield of ketone when the decomposition was carried out in the absence of pinane. The reaction products are being investigated further with reference to other possible cyclobutane ring containing intermediates.

75 Stinson, J. S., and Lawrence, R. V.
SYNTHESIS OF SYM-HOMOPINIC ACID. Jour. Organic Chem. 19(7): 1047-1053. 1954.

sym-Homopinic acid (a C_{10} dibasic acid) was prepared from pinonic acid, (a C_{10} keto-monobasic acid) by means of the Willgerodt reaction. The Kindler modification using a dry amine and sulfur gave better yields than the original Willgerodt procedure. Appreciable yields were obtained with primary and tertiary amines as well as secondary amines. The effect of reaction time and concentrations of sulfur and morpholine on the yield was determined. The maximum yield obtained with this amine was 82%. Derivatives of sym-homopinic acid were prepared.

Rosin

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FUSED METAL RESINATES FROM ALDEHYDE-MODIFIED ROSIN. Indus. and Engin. Chem. 46(9): 1973-1976. 1954.

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A simple method of preparing fused metal resinates that contain approximately a stoichimetric quantity of metal has been developed by modifying rosin with an aldehyde and fusing this aldehyde-modified rosin with a reactive metal compound. Metal resinates prepared from aldehyde-modified rosins do not block and show good sulubility in petroleum naphtha, turpentine, and mineral spirits. Metal resinates of all the common metals have been prepared from aldehyde-modified rosins. Metal resinates may be prepared from aldehyde-modified rosin derivatives that have an Acid No. of less than 20.

General

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EXPAND RESEARCH, CHANGE EMPHASIS TO MEET NEW NEEDS OF GUM NAVAL STORES INDUSTRY. Naval Stores Rev. and Terpene Chemicals. 64(8): 10-11, 19. 1954.

A team of scientists at the Naval Stores Station equipped with up-to-date research tools and techniques, are probing for information about the structure, composition, and properties of pine gum, turpentine, and rosin. They are finding pine gum, turpentine, and rosin a treasure house of potential new materials. One new chemical obtained from pine gum was recently commercialized. A new discovery is an unusual acid in pine gum and rosin -- never before isolated or identified. Information about the properties of this acid may help in understanding the unique qualities of rosin. This article describes the research program. Information given indicates that results so far are promising for the future.

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